Jan. 23, 1945. A. P. BOCK 2,367,922

VARIABLE INDUCTOR

Filed Oct. 22, 1942

Fig. 1.

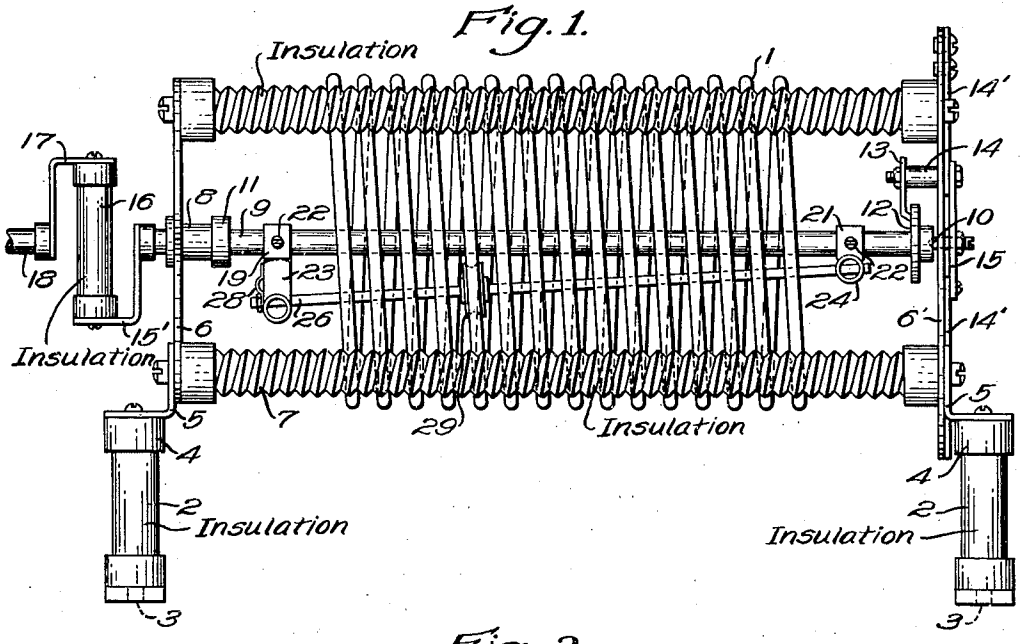
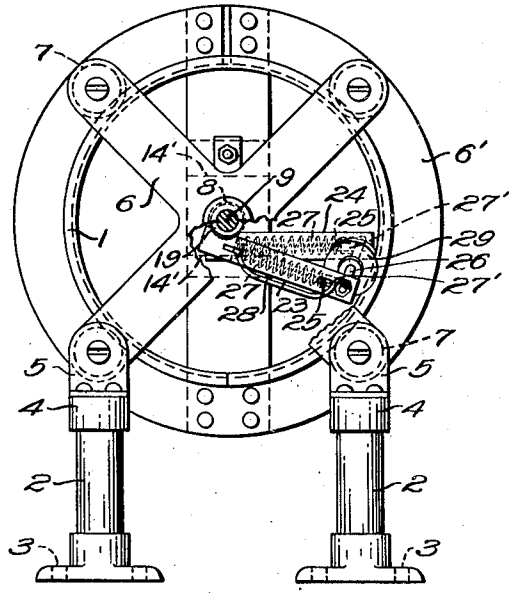


Fig. 2.



WITNESSES:

Robert C. Baird

Mrs. C. Groome

INVENTOR

Ashley P. Bock.

BY F. W. Leyh.

ATTORNEY

Patented Jan. 23, 1945 2,367,922

UNITED STATES PATENT OFFICE

2,367,922

VARIABLE INDUCTOR

Ashley P. Bock, Catonsville, Md., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application October 22, 1942, Serial No. 463,003

2 Claims. (Cl. 171—242)

My invention relates to variable inductors, and in particular, relates to a variable inductor of the type adapted to carry high frequency currents of large magnitude.

One object of my invention is to produce a variable inductor of large current capacity which shall have a movable contact capable of changing its inductance from substantially zero to its full value, and in which good electrical contact between the movable contact and the inductor is assured at all times.

Another object of my invention is to provide a variable inductor having a contact movable substantially throughout its entire length in which friction between the movable contact and the inductor is reduced to a minimum while good electrical contact between the two is assured at all times.

Still another object of my invention is to provide a variable inductor with a structure having high rigidity and mechanical strength but which is economical in manufacture and reliable in service.

Other objects of my invention will become apparent from a reading of the following specification taken in connection with the accompanying drawing, in which

Figure 1 is a view in elevation of an inductor embodying the features of my invention; and

Fig. 2 is an end view of the structure of Fig. 1, partly in section, to illustrate certain features of the construction.

Referring in detail to the drawing, a conductor 1 in the form of a helix and preferably comprising a hollow copper pipe forms the current carrying element of the inductor. The conductor 1 is supported upon a framework having four supporting posts 2 positioned at the corners of a rectangle and adapted to be held to a supporting bench by bolts passing through holes 3 in metal bases. The posts 2 preferably comprise porcelain or other suitable insulating material, and are provided at their upper ends with caps 4 of metal, each provided with a metal bracket 5 at one end of the structure. The two brackets 5 support a metallic cruciform end member 6, while the two brackets 5 at the other end are fixed to a metal ring 6' which has a radial cut at its top. The two end assemblies thus formed are spaced apart by four insulators 7 which may be of porcelain and which are preferably provided with helical grooves running substantially from end to end thereof.

The insulators 7 are held in position by screws locking them to the end members 6 and 6'. The helical conductor 1 is made to have a pitch between turns preferably equal to two turns of the helices on the helical groove and the spacing between members 7 is made such that the inside face of the helical grooves engages the outer edge of the helical conductor 1 thus retaining the latter rigidly in place.

One end of the conductor 1 may be clamped rigidly to an insulator 7 by a split sleeve fitting the exterior surface of the latter at the proper point, and this split sleeve may be provided with a terminal lug to which an external circuit may be connected.

One of the end members 6 supports a bearing 8 in which is journalled a rotatable shaft 9 of metal, the shaft 9 extending lengthwise and leaving a self aligning bearing 10 on the other end member 6'. The shaft 9 carries a collar 11 bearing against the end of journal 8 and also has a plate 12 preferably of good conducting material, against which there bears a brush 13 which is carried on a support 14. A pair of plates 14', preferably of insulation, extend vertically from the top and bottom points on the ring 6' and support a bearing plate 15 to which the above-mentioned bearing 10 and the above-mentioned support 14 are attached. A terminal lug for attachment of an external circuit may be connected to the brush 13. The other end of the shaft 9 is provided with an L-shaped arm 15' which carries an insulator 16, the latter being perpendicular to the central axis of the shaft 9 and transversely intersecting the latter. The other end of the insulator 16 carries an L-shaped arm 17 which is attached to a second shaft 18, coaxially supported relative to the shaft 9 and which is used to impart rotary movement to the shaft 9 through the insulator 16.

The shaft 9 is provided with two collars 19 and 21 which may be clamped in fixed position relative to the shaft 9 by set screws 22. The collars 19 and 21 support tubular arms 23 and 24, each of which has a pair of slots 25 diametrically opposite each other and extending parallel to its axis near the outer end of the tubular arm. A rod 26 extends through these tubular slots 25 and is biased outwardly from the shaft 10 by a helical spring 27 enclosed within each of the tubular arms 23 and 24 and bearing against a piston 27'. A flexible connector 28 connects the rod 26 to one of the arms 23.

The rod 26 slidably and rotatably supports a trolley 29 having a groove in its periphery which substantially fits the surface of the helical con-

ductor 1 and the trolley 29 sliding along this rod 26 bears against the interior face of the helical conductor 1 under bias of the springs 27. The arms 23 and 24 have their ends displaced angularly about the axis of the shaft 9 to the degree necessary to make the plane of the groove in the trolley 29 parallel to the central axis of the conductor 1. Since the helix of the conductor 1 has a constant pitch throughout its length, the plane of the trolley 29 as it bears against the interior surface of the conductor 1 will maintain a constant angle relative to the central axis of the shaft 9; hence, the rod 26, being perpendicular to the plane of the trolley 29, will always maintain a constant position relative to the arms 23 and 24, and the tubular arms 23 and 24 can be clamped in position on shaft 9 by the set screws 22.

It will be evident from the foregoing that rotation of the shaft 9 will rotate the arms 23 and 24 carrying the rod 26 and the trolley 29 about the central axis of the shaft 9, and that the grooves in the trolley 29 will continually bear against the interior face of the conductor 1 thereby sliding the trolley 29 along the rod 26. Good electrical contact will accordingly be made from the brush 13 through the plate 12, shaft 9, arm 23, flexible conductor 28, rod 26, trolley 29 to some point on the interior face along the length of helical conductor 1, and current can then flow to the external circuit again through the above-mentioned terminal clamp at one end of conductor 1. The length of the helix 1 which will thus be included in the electrical circuit can be varied by rotating the shaft 9 so that the trolley 29 tracks its way along the conductor 1, rotation of the shaft 9 in one direction decreasing the length, and consequent circuit inductance of the electrical conductor 1 which is included in the electrical circuit, and rotation of the shaft 9 in the opposite direction increasing this length and electrical inductance. Since the plane of the trolley 29 is always parallel to the axis of the conductor 1 at their point of contact, the trolley 29 merely rolls along the conductor 1 and there is a minimum of friction between them and great uniformity of contact is maintained. The static friction of the sliding movement of trolley 29 along the axis of shaft 26 is eliminated because trolley 29 rotates on shaft 26 at the same time it slides along. This action results in very smooth starting of the mechanism as well as smooth operation while in motion.

I claim as my invention:

1. In a variable inductor, a conductor in the form of a helix having points on its exterior periphery in contact with a plurality of grooved insulating supports which are maintained in spaced relation with each other, a movable contact for the interior face of said conductor in the form of a grooved trolley slidingly supported on a rod carried by two arms projecting from a shaft positioned in the central axis of the helix, said rod being angularly disposed relative to said axis whereby the groove in said trolley is parallel to said helical conductor at its point of contact therewith.

2. In a variable inductor, a conductor in the form of a helix having points on its exterior periphery in contact with a plurality of groove insulating supports which are maintained in spaced relation with each other, a rotatable shaft in the axis of said helix, a pair of arms spaced apart longtudinally and angularly extending from said shaft, a rod slidably supported by said arms and biased outward relative to said shaft and a grooved trolley slidably and rotatably mounted on said rod and rolling with its groove engaging the interior face of said conductor.

ASHLEY P. BOCK.